SEEDS Draft Standards Process Report

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1 Introduction

SEEDS will bring together diverse, distributed components contributed by many investigators, data providers, and institutions. SEEDS components will be loosely coupled, but will conform to a minimal set of interfaces and standards, so as to facilitate system interoperability and data inter-use in keeping with the objectives of the Earth Science Enterprise (ESE).

The Long Term Standards Process (LTSP) study has sought to define a process whereby SEEDS can develop, adopt, evolve, and maintain standards and standard interfaces for data and information systems and services across the ESE. Each part of the process capitalizes on the methods and experience of previous and ongoing NASA programs and of existing standards bodies. The collection of standards and guidelines established by this process will affect a wide range of ESE endeavors; therefore data and service providers, and science and application users, must all take part in defining these standards.

Figure 1 illustrates some possible top-level interfaces between data subsystems, from the initial satellite sensor to the archive and distribution channels. Developing and adopting standards will be crucial to insuring that these systems and their users can easily interoperate – that is, share data and work together, efficiently and effectively. This will save time and money and will provide new opportunities for collaboration and interdisciplinary work. The process by which standards are selected and approved is critical to their acceptance by the SEEDS communities.

Figure 1 Simplified Data Flow diagram

This document provides a brief description of the LTSP study team's work, and presents process options for SEEDS standards. The study team approached the task of defining a standards process by surveying a variety of standards organizations and ESE projects. It should be noted that the standard process developed in this report remains at a high level. This implies that the structural organization of the process, and by-laws

are not defined. The various committees and their compositions still need to be identified. In other words the report describes the "what" and left out the "how" and "who" (roles and responsibilities) that require further inputs and interaction with the SEEDS community.

Section 2 summarizes the analysis of the decision processes of various standards organizations, government agencies, and ESE projects: their goals, emphasis, and structure, pros and cons, etc. Based on this review and their own past experience, team members and consultants drew up a list of guidelines they thought a standards process should follow.

From this analysis, a consensus emerged among the study team members that the Internet Engineering Task Force (IETF) standards process seemed to be the closest to what SEEDS needed. Using the IETF process as a starting point, the team and its consultants developed a top-level notional SEEDS standards process, and presented it at the 2nd SEEDS workshop, held in June 2002 in San Diego, California. The team derived processes to approve, adopt, develop, and manage standards. The team has begun, and will continue, revising the draft SEEDS standards process in response to comments from the SEEDS community. Section 3 details elements of the notional standard process.

Sections 4-6 present issues and recommendations compiled during the 2nd SEEDS public workshop, and recommendations generated by the study team, which also appear in the SEEDS Formulation Team Recommendations document. Finally, Section 7 describes future work remaining in defining a standards process for long term ESE use.

1.1 Standards overview

Standards have been recognized as essential to achieve interoperability among systems. A standard is defined as "That which is established as a rule or model by authority, custom, or general consent; criterion; test." Another approach to describe a standard is to examine some categories of standards.

One can categorize standards by the process used in their development:

- *De facto* standards are used extensively but are not ratified by a standards organization such as the International Organization for Standardization (ISO).
- *De jure* standards are ratified by a standards organization.

One may view standards based on their availability:

- *Open* standards are published and made available to anyone. Some standards are distributed freely but others must be purchased.
- *Proprietary* standards are kept confidential by their originating organization or firm. One can only use such a standard by using that firm's products.

One may distinguish standards by how their use is enforced:

- *Core* standards are required in the development of a system.

- *Non-core* standards may be used in the development of a system.

Standards may be used at various levels within and among organizations. There are *project* standards, *enterprise* standards, *national* and *international* standards, *domain* standards, and *community* standards.

One may also compare standards based on their domain:

- *Data* standards.
- *Content* standards describe the kind of information but not necessarily the form.
- *Communication* standards.
- *Encoding* standards describe what form information must take.
- *Interface* standards.
- *Transfer* standards describe how the data is moved from one location to another one.
- *Service* standards describe the type of services provided (e.g., web services).
- *Process* standards.

The FGDC [1]standards reference model is composed of 4 basic categories: data, processes, organizations, and technology. A given standard may belong to several categories.

Data standards: These standards describe how the bits of information are defined and structured. There are several types of Data standards: Data classification, data content, data symbology, data transfer, and data useability.

Process standards (called also service): These standards describe the "tasks and how information and technology are used to accomplish organizational goals". The types of processes standards are: general data transfer procedures, specific data transfer procedures, existing data access procedures, classification methodology, data collection, storage procedures, presentation standards, data analyzing procedures, data integration, quality control and quality assurance.

Organizations standards: These standards are the specifications for communication among communities.

Technology standards: " technology standards relate to the tools, environment, and interfaces among systems, and are often called information technology specifications".

[1] the FGDC standards reference model which can be found at http://www.fgdc.gov/standards/refmod97.pdf

1.2 Methodology

Developing a SEEDS standard process is a difficult task, which requires deep engagement from the SEEDS community. The study team discussed the following approach with community members at the 1st SEEDS public workshop in College Park, MD, February 2002:

- *Analyze the standards processes of major standards organizations* relevant to SEEDS: ISO's Technical Committee 211 (Geographic Information / Geomatics), the Open GIS Consortium (OGC), the World Wide Web Consortium (W3C), the Consultative Committee for Space Data Systems (CCSDS), the US Federal Geographical Data Committee (FGDC), and the Internet Engineering Task Force (IETF). In addition to these formal organizations, the study team examined standards processes in NASA's Earth Science Enterprise and in other US federal agencies. The SEEDS Standards and Interfaces Process Draft Survey Report gives a complete description of these findings.
- *Define "Guidelines" for the standards process*, based on the above survey and on team members' personal experience with standards and standards processes.
- *Identify a process model.* Through numerous teleconferences and meetings, the study team and its consultants favored the IETF as a basis for an overall standards process. The team felt that the IETF process was "light touch"; it emphasized implementation over "paper standards"; it had stood the test of time, and had seen widespread use.
- *Develop a notional standard process, with input from the community.* Using the IETF model, the study team devised a notional standard process for SEEDS, based on current findings and past experience, analysis of the survey report, and community input via workshops, interviews, and consultants.

  The team discussed this notional process with representatives from the SEEDS community during the 2nd SEEDS public workshop, in San Diego, California, June 2002.

2 Analysis of standard organizations and projects

2.1 Comparison of standard organizations

Tables 1 and 2 compare several standards organizations and standards processes, including the goals, differences, and overall structure of the organizations. This list is not exhaustive, but it reflects some important characteristics of the standards processes.

Table 1 Comparison of standard organizations

	ISO TC 211	OGC	W3C	CCSDS
Goals and emphasis	Establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth	Enable interoperable geo-spatial software to grow the geo-spatial industry	Bring the web to its full potential; prevent fragmentation of the Web; support advanced uses of the Web (semantic Web)	Developing standard data handling techniques to support space research, including space science and applications
Organization	International body with national representation. Members must be appointed by national body.	Industry consortium. Any organization may join.	Industry consortium. Any organization may join in.	Space Agencies, plus associated organizations sponsored by a Space Agency
Domains	Object modeling; Abstract models; content standards and vocabulary	Interface design; protocols and interfaces for control and communication	Architecture ; Content formats ; interaction , technology, web accessibility	telemetry ; information interchange processes ; cross support ops ; radiometric and orbit data; archiving
Membership fees	ANSI INCITS Dues to be a member of US Delegation: $800 per year	$ 300 - 50,000 and up	$5,700 / $57,000	None
Development time for new standard([2])	2-3 years	1-3 years	Usable drafts in a few months	2-4 years
Implementation requirement	no	Yes. (fast track; interoperability Program)	Reference implementations	Strongly encouraged for implementable standards
Standard document cost	Documents cost money / anyone can purchase	Documents are free / web accessible	Documents are free / web accessible	Documents are free / web accessible
Pros	open process ; common vocabulary, reference materials; not influenced by funding	Specs must be demonstrated on demand. Commercialization within 1 year; test-bed to try out new interfaces with implementation before specs are finalized; levels of membership don't matter for tech discussions	Specs need working implementation (freely available); most specs have open source working implementation code that can be downloaded by anyone; notes are white papers that can be submitted by any member and made available on the public web site	document available to the public; there are abstract specs and implementation specs.
Cons	not directly useful for implementers; fees to obtain documents; slow process; difficult to access drafts without membership	Standards track can bog down. Large number of activities spreads membership too thin. Connection between spec program and test-bed program sometimes tenuous.	W3C Director (Tim Berners-Lee) has veto power	Semi-closed organization
Comments	Connection between standards and implementations takes a long time to establish.	Has developed wide recognition. Not much market acceptance of most specs yet.	all specs are implementation specs; some internal email lists are available to the public	strict process;

[2] These times are rough estimates that can be highly variable within the same organization

Table 2 Comparison of standard organizations (continued)

	Grid Computing	FGDC	IETF	SUN Java
Goals and emphasis	Promotion and development of Grid technologies and applications	Coordinates the development of the National Spatial Data Infrastructure (NSDI)	Concerned with the evolution of the Internet architecture and the smooth operation of the Internet.	Develop and revise Java technology specifications, reference implementations, and technology compatibility kits
Organization	Individual or sponsor memberships. Anyone may join.	US Inter-governmental committee	International community of network designers, operators, vendors, and researchers	Individual or organizational membership. Anyone may join.
Domains	Grid technologies, distributed computing	technology , organizations , data, processes	Internet-related standards and protocols	Java technologies for desktop and server
Membership fees	$ for general membership and free for students	Free; open to government agencies	Free to the public	$100 - $5000
Development time for new standard(2)	Documents are produced in few months time.	2-5 years	1-2 years	
Implementation requirement	Std. needs proof of implementation		Std. needs proof of implementation	Yes : reference implementation (RI)
Standard document cost	Documents are free / web accessible	Documents are free / web accessible	Documents are free / web accessible	Documents are free / web accessible
Pros	Grass roots, community initiated process; involves industrial participation	educate users; active outreach; free training sessions, tech support; small grants to data providers	open to public; quick turn around ; significant implementation ; all documents are easily accessible to the public ; 2 or more interoperable independent working implementations for each draft spec	any member of the java community can submit a proposal; quick completion of the process; prototype and test suites; public review
Cons	Hands-on experience is needed to participate effectively	Closed (only government agencies) but open to public for comments; no working implementation required;	Hands-on experience is needed to participate effectively ;IETF's "rough consensus and running code" isn't as fully open as a more formal consensus / voting process might be; Certain highly-respected "elders" tend to run the show; There's no built-in mechanism to silence "loudmouths."	power of the executive committee
Comments	GGF has a short history and hence difficult to evaluate its work in terms of standards development. Follows IETF based approach.	developed the metadata content standard ; executive mandate	Long tenure as an important standards body suggests there is value in the process & output.	

As shown in tables 1 and 2, each standard organization has a different set of goals, structure, and domains. A long development time to complete a standard may be appropriate with some standards that do not evolve quickly but ESE would greatly benefit from short development time that do not compromise on the quality of the standard. Based on past experience the study team members felt that having an implementation is a necessity to insure acceptance by the community. Some organizations are charging high fees for some of its members. This could deter users from participating to the standard development and could considerably limit the size of

the community. Having free documentation available on the web is needed to promote the acceptance of the SEEDS standards. Each standard organization has its own set of pros and cons but the IETF seemed to be the closest that satisfy our guidelines listed in 2.3.

2.2 Comparison of Projects

Table 3 compares three major science data management projects sponsored by ESE. These three projects demonstrate an evolution of distributed data management practices from initial prototypes through a large, homogeneous system to a heterogeneous federated collection of data providers. SEEDS is expected to build on lessons learned from these projects and continue the evolutionary progress.

Table 3 comparison of Projects

	V0	ECS	Federation
Goals and emphasis	Prototype heterogeneous distributed data system with catalog interoperability	Operational, uniform, end-to-end distributed data system for multiple large data streams	Experiment in cooperating data centers with innovative data products and services
Scope	Distributed data search and order with common metadata model, to overlay existing, data systems	entire data system for multiple missions, large volume	loosely coupled data centers with no well defined requirements
Members	DAACs , science, government representatives; 30 people	ECS contractors and government	interoperability committees (up to) 60
methodology	Iterative – consensus building, telecons	iterative	Consensus by tiger team of experts
Contract vehicle	task oriented contracts with DAACs	single massive contract	RFP, proposals within Federation
Decision making	Consensus building, telecons	Reviews, milestones	Unclear; consensus by committees
communities	stakeholders, data providers; users	data providers, users, science reps	communities involved, data providers; ESIP II, III
type	shared software	software released and installed	no sharing of software but sharing of data access
Pros	full participation in the review process; multiple contracts ; team funded to provide directions; iterative approach; developed new technology; decision made through consensus building; working implementation shared when possible; community involvement for stakeholder data providers	developed new technology	volunteer effort to do coordination
Cons	Prototype software used as operational for many years; single user interface multiple data centers with very different communities and requirements - serves everyone adequately, but not tailored to serve anyone really well	review process limited ; funding was under a single contract ; contractor funded to do everything; water fall methodology; one size fits all; lack of communications	RFP proposal, evaluation detrimental to changes; no review by funded user groups; no mandate; management only vote; ill defined requirements; interoperability interface expected but not funded ; technical team does not make any decision
Comments	interoperable inventory search and order capability across multiple data centers desired for heritage data	entire data systems from scratch for multiple new missions with large data volume; picked wrong technology (e.g., DCE); executable software was released and installed at data providers	loosely coupled data provider network; development team was the interoperability committee

Similarly to section 2.1 on standard organizations, table 3 provides a synopsis view of V0 projects, ECS, and Federation. The goals and objectives were different but there were several aspects in the processes that should be noted. The contractual mechanism is important and can be an impediment to the process in some cases. Consensus is another topics of great importance.

2.3 Guidelines

The first task of the LTSP study was to compile a report on the standards activities of Earth science data systems projects and the processes, procedures, and results of relevant standards bodies and organizations. This report, titled, "Standards Organizations and Projects Survey Report," was reviewed and analyzed to draw a set of general recommendations for SEEDS to follow and to develop candidate processes that the Enterprise could utilize to establish and support standards.

The LTSP study results include the work of the team members, the reviews and suggestions of the consultants, and the community input.

From the study of previous and ongoing NASA programs and of existing standard bodies (e.g., ISO TC 211, OGC, W3C), the LTSP has identified a list of criteria that any ESE standards process should satisfy.

1. ESE should have a set of simple, open, well-defined processes to establish standards and standard interfaces for the ESE data systems. These processes must be evaluated using established performance metrics. The ESE standards must be documented and openly accessible.
2. ESE standards processes must support evolution of standards and standard interfaces (e.g., to respond to changing requirements or new technology).
3. ESE standards must be based on implementation experience and be supported by software tools.
4. ESE data systems standards processes must enable participation by the community and by external organizations. Active participation in the ESE data systems standards processes by the community including data users, missions, value-added providers, application users, and data centers is essential. Active participation in the ESE data systems standards processes by the US federal, state, and local agencies, international agencies, industry partners, commercial vendors, and international standards organizations is also highly desirable and should be encouraged.
5. The ESE data systems standards process should be time bounded.
6. The ESE data systems standards process should have an appeal process to review contested decisions.
7. The ESE data systems standards process should encourage the use of existing successful standards and only develop new ones when deemed necessary. This will increase interoperability with existing systems and reduce ESE development costs.

3 Standard Process

3.1 Notional standards process

The Long-Term Standards Process study has identified and developed a set of processes to develop, adopt, evolve, and maintain standards and standard interfaces for data and information systems and services across the ESE. The notional process is based on the process in use at the Internet Engineering Task Force (IETF). [http://www.ietf.org/]. Two IETF documents describe their process: RFC 2026 and RFC 3061. The IETF process provides technical excellence, prior implementation and testing, clear and concise documentation, openness and fairness, and potential for timeliness.

The findings, recommendations, and proposed processes have been presented at two SEEDS community workshops and have been refined to incorporate comments and ideas from the community. Based on this study the Long Term Standards Process (LTSP) team recommends

1. The ESE standards process should be based on the process in use at the IETF.
2. The IETF standards process should be adopted but tailored to meet the specific needs of ESE.

Section 3.2 sketches the overall standards process, followed by more detailed views of the processes to Develop, Adopt, Approve, and Manage standards.

3.2 Overall standards process

Figure 2 depicts the overall process as a “flow diagram” with the following symbols:

- Blue clouds represent entities external to the process itself, but closely involved in conducting, overseeing, or otherwise influencing it.
- Green Rectangles represent the inputs and outputs of the processes. These documents would be visible to all participants and external groups.
- Tan Rounded Rectangles represent activities of the process itself.

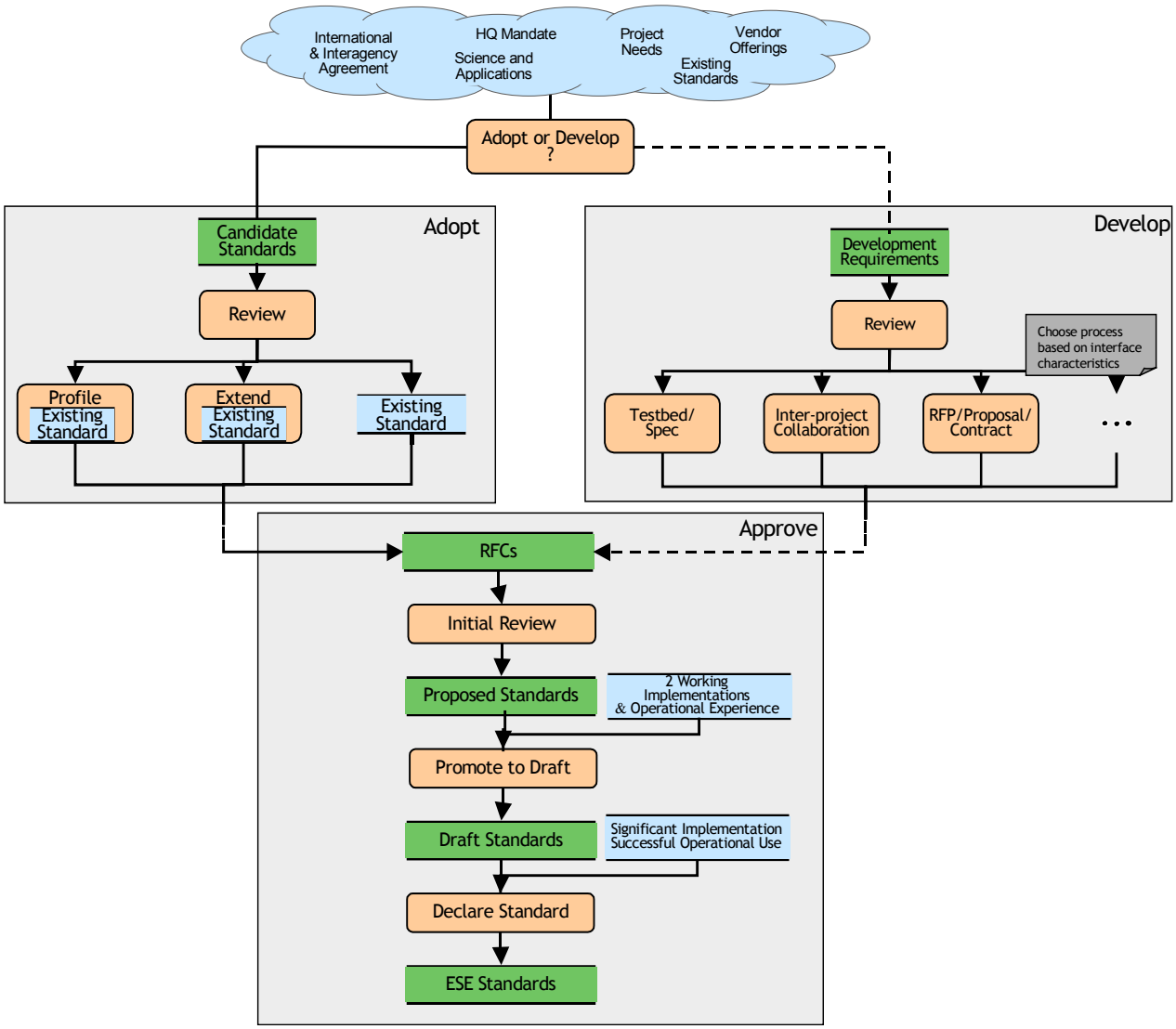

Figure 2 Overall Standards Process

The process might be set in motion by many sources of standards, and of requirements for standards:

- *Science and applications* often integrate information from many data sources.
- *Mandates,* usually from NASA Headquarters, based on internal NASA requirements or on Congressional mandates, international agreements, inter-agency agreements, etc.
- *Project needs*. Some of these needs can be met by existing standards; others may require newly developed standards. When drawing on existing standards, projects may draw on *de jure* standards from standards organizations, or on *de facto* standards from vendors or vendor groups.

- *Existing Standards.* Many standards organizations produce standards that affect the design of ESE systems. These organizations are an important source of existing or emerging standards that can be adopted as ESE standards.
- *Vendors.* Often vendor implementations or formats become widely used and become *de facto* standards. ESE may choose to adopt these standards.

Once initiated, the process has two major pathways towards establishing an ESE standard. If a suitable standard already exists, an *adoption* process (section 3.3) proposes it as a candidate and may adopt it as a standard. If no suitable standard exists to meet an identified need, a separate *development* process (section 3.4) creates a new candidate standard.

The result of either the adoption or development process is a " Proposed ESE Standard" document in the form of an RFC[3], which is fed into the *approval* process (section 3.5). . In the case of an adopted standard, the document would reference the external standard, describe the reason for adopting it, and explain whether the adopted standard is to be adopted as-is or with some restrictions or modifications. In the case of a developed standard, the document would contain a precise description of the standard and the reason it was developed. These documents would be available for inspection by anyone.

The Proposed ESE Standard RFC would flow through the approval process, which would provide opportunities for anyone to review it, test it, decide whether it should become an ESE Standard, whether it needs more work, or should be rejected outright. RFCs that are approved would then become ESE Standards.

Finally, a management process (section 3.6) would be used to maintain ESE Standards as well as to provide additional support to users and potential users of the standard.

3.3 Standards adoption process

Just as the IETF has a large collection of documents in its standards repository, it is anticipated that the ESE Standards repository will eventually also accrue a large set of standards. However, the LTSP team believes that many of the standards in use at ESE will be externally-developed standards such as those developed by the Open GIS Consortium (OGC), the International Organization for Standardization (ISO), the IETF, etc.

Adopting a standard can be done in three different ways. It can be

1. Adopted with no modifications
2. Adopted as a profile (i.e. with restrictions)
3. Adopted with extensions

In all three cases, the proposers would describe how an external standard would be used within NASA ESE, reference the standard, and submit it to the Approve process.

[3] RFC (Request For Comment) is a term used in the IETF. An RFC is meant to elicit comments from the community and those comments are used to improve the document and provide feedback about the relative interest of the community in the content of the document.

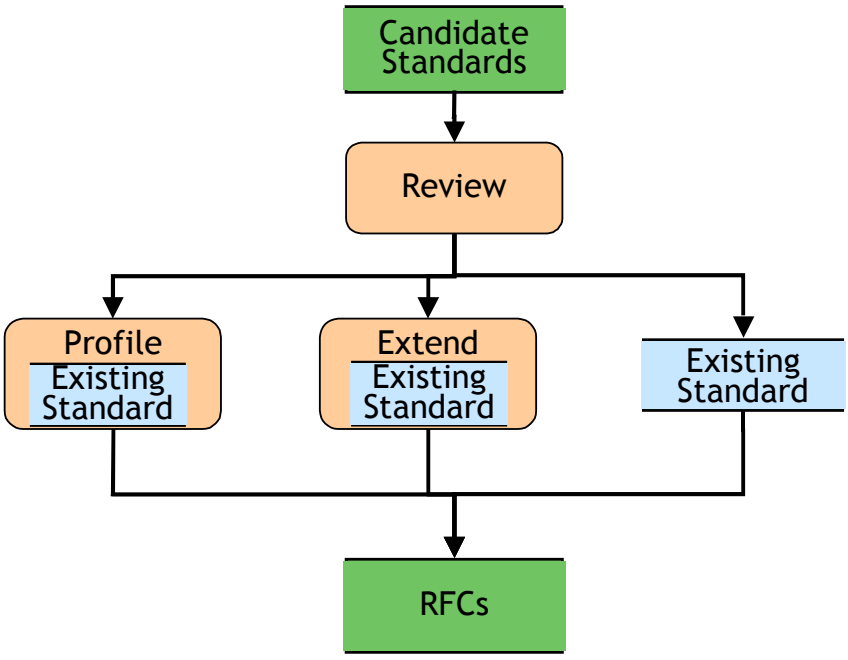

Figure 3 Standard Adoption Process

3.3.1 Review of candidate standards

Candidate standards would be first reviewed on the basis of whether there is sufficient need for the standard to be considered for adoption. If the review indicates that it should be considered, then the process continues. If not, then the proposers can appeal and possibly re-submit the candidate standard.

3.3.2 Adoption with no modifications

The process of adopting a standard can take one of three paths. Where an external standard is relevant to ESE as is, with no modifications, then the standard can be referenced in the Proposed ESE Standard RFC document along with a rationale for adoption. Then it should be entered into the Approve process.

3.3.3 Adoption as a Profile

If an external standard exists, but is too broadly scoped or is designed to be narrowed down before use, then there may be a need to develop a profile of the standard. (For example, when developing websites, the Section 508 accessibility legislation might dictate a particular usage of HTML. A "profile" of HTML can be developed that documents how it should be used to comply with congressionally mandated Section 508 accessibility guidelines.) This profile would be described in the Proposed ESE Standard RFC document. Then it should be entered into the Approve process.

3.3.4 Adoption as an extension

Other external standards are designed to be extensible. For example, SMTP (Simple Mail Transfer Protocol) allows for message headers that are not documented in the base protocol document. These headers generally have the form "X-some-string: some value" and are meant to convey additional information about the message. Someone could develop a standard set of extensions for SMTP that are useful within NASA ESE and document them in a Proposed ESE Standard RFC document, to be entered into the Approve process.

3.4 Standards development process

There will be times when a standard does not exist, but there is a recognized need for one. When this happens, the requirements for the standard can be submitted to a development process. Initial review would determine whether the requirements can be met by following a development process.

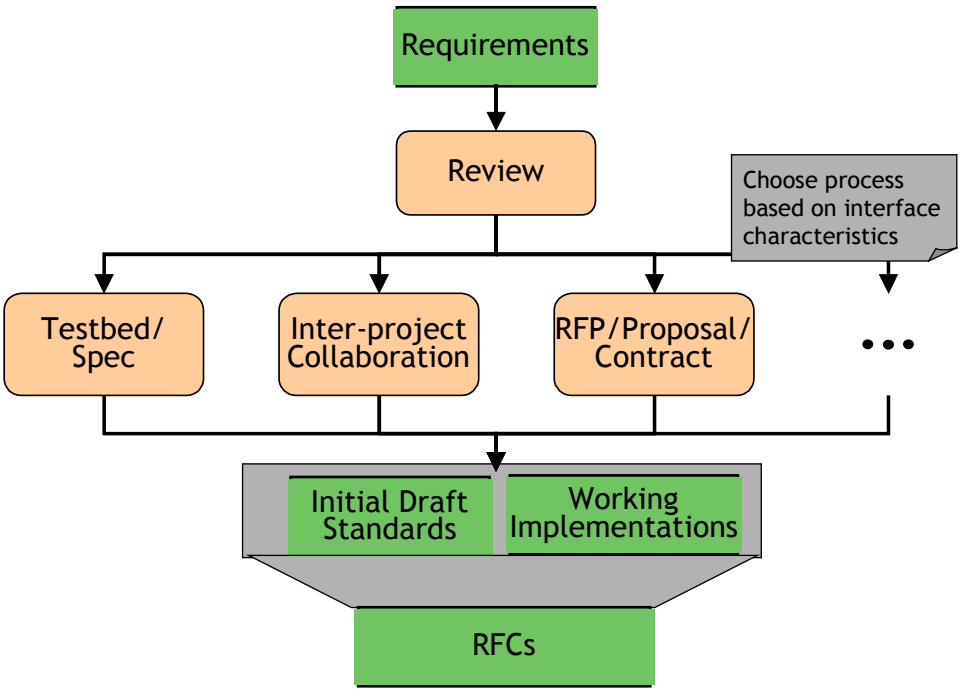

Figure 4 Standards Development Process

There are many ways to develop standards. Many standards organizations exist to do this. One characteristic shared by all successful development processes is a collaborative approach. The following are some possible approaches for SEEDS standards development:

- A multi-vendor testbed such as that employed by the Open GIS Consortium to develop some of its specifications.
- A collaborative process within ESE that would bring together several project teams that have a stake in the resulting standard.
- A traditional contracting approach where a vendor or research group is hired to help develop the standard.

If the development approach is successful, the resulting initial draft standard should also be embodied in initial working implementations, which can be submitted into the standards approval process as part of a Proposed Standard.

3.5 Standards approval process

The approval process is most closely patterned after the IETF process. As a Proposed ESE Standard RFC moves through the process, it becomes increasingly more robust (or perhaps, alternatively, as it becomes more robust, it can move through the process). There are three points at which the standard is either advanced or rejected.

3.5.1 Submitted RFCs

The input to the Approve process is a Proposed ESE Standard RFC, submitted by SEEDS participants. The IETF RFC 2026 says this about a Proposed Standard: [RFC2026, Section 4.1.1]

> "A Proposed Standard specification is generally stable, has resolved known design choices, is believed to be well-understood, has received significant community review, and appears to enjoy enough community interest to be considered valuable. However, further experience might result in a change or even retraction of the specification before it advances.
>
> "Usually, neither implementation nor operational experience is required for the designation of a specification as a Proposed Standard. However, such experience is highly desirable, and will usually represent a strong argument in favor of a Proposed Standard designation."

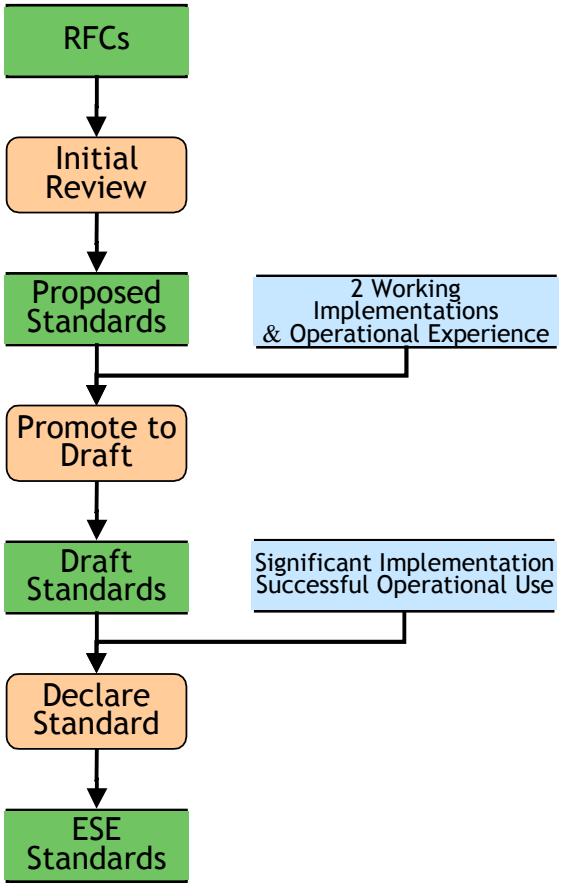

Figure 5 Standards Approval Process

3.5.2 Proposed ESE Standards

As a slight departure from the IETF model, we impose a first decision point called "Initial Review," to select those standards that are likely to be of high quality and widespread interest. This is shown as advancing the Proposed ESE standard RFC along the aprroval process . If a proposed standard fails to be approved for consideration, the proposers can appeal and/or modify their proposal and resubmit. The approval process provides an opportunity for further review and experimentation with the proposed standard.

After a certain amount of time (such as 6 months for example) and two working implementations, a Proposed ESE Standard RFC can be come a Draft ESE Standard.

3.5.3 Draft ESE Standard

RFC 2026, Section 4.1.2, describes a Draft Standard:

> "A specification from which at least two independent and interoperable implementations from different code bases have been developed, and for which sufficient successful operational experience has been obtained, may be elevated to the "Draft Standard" level. For the purposes of this section, "interoperable" means to be functionally equivalent or interchangeable components of the system or process in which they are used."

RFC 2026, Section 4.1.2 continues:

> "A Draft Standard must be well-understood and known to be quite stable, both in its semantics and as a basis for developing an implementation. A Draft Standard may still require additional or more widespread field experience, since it is possible for implementations based on Draft Standard specifications to demonstrate unforeseen behavior when subjected to large-scale use in production environments.
>
> "A Draft Standard is normally considered to be a final specification, and changes are likely to be made only to solve specific problems encountered. In most circumstances, it is reasonable for vendors to deploy implementations of Draft Standards into a disruption sensitive environment."

Draft standards may be recommended for widespread use within the SEEDS environment, in order to gain significant operational experience.

3.5.4 ESE Standard

Finally, a successful draft standard can become an ESE Standard. IETF RFC 2026, Section 4.1.3, describes this as follows:

"A specification for which significant implementation and successful operational experience has been obtained (…). An Internet Standard (…) is characterized by a high degree of technical maturity and by a generally held belief that the specified protocol or service provides significant benefit to the Internet community "

3.6 Associated Activities - Standards management process

Once a standard has become an ESE standard, there should be a process that manages it. This process would include

- A maintenance process whereby revisions or updates would be fed back into the standards process.
- An evaluation process that would provide feedback to ESE and project management on the effectiveness of the overall process.
- Assistance in using the standard. This would include possible technical support to implementers, advice to potential users, and promotional activities advocating its use by many projects or communities.
- Submission of the standard to a standards organization for consideration as a *de jure* standard as well as collaboration with standards organizations as they develop standards of use to ESE.

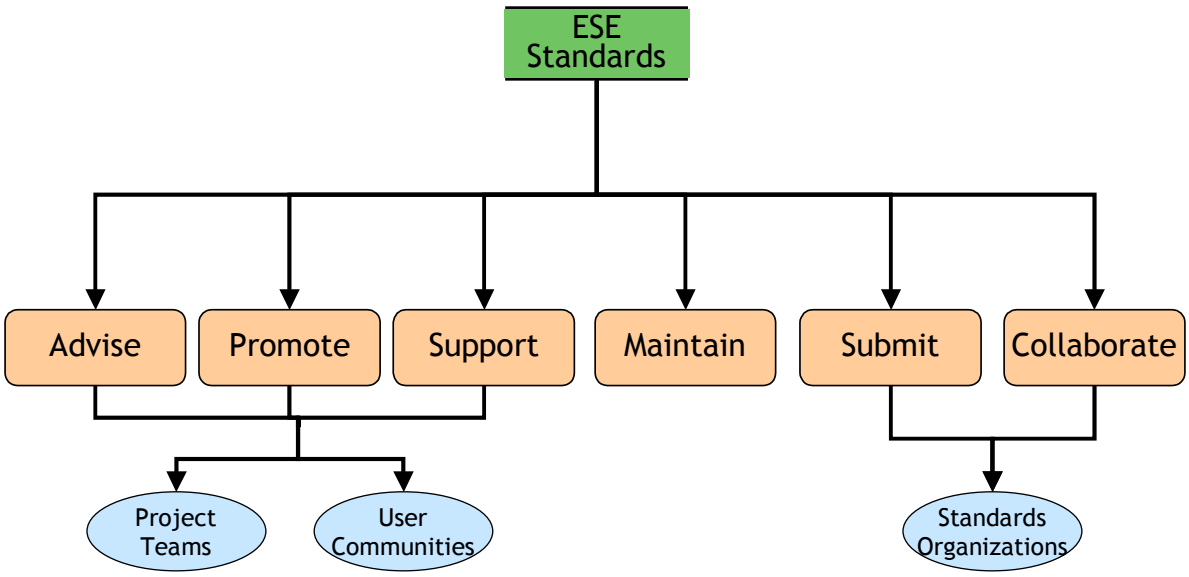

Figure 6 Standards Management Process

4 Outstanding Issues/ Implications

The ESE must take into consideration the following potential issues when implementing a SEEDS Standards Process. These issues derive from the unique circumstances of the Enterprise and the recommended IETF process, as we presently understand it.

1. SEEDS scope

   A clear understanding of the scope of the SEEDS-defined standards processes is needed. This will clarify the role and responsibilities of the various ESE offices and define which activities are supported such as training, tool development, technical support, prototyping, implementation, and community participation in the standards process.

2. Authority issues

   SEEDS needs to evaluate and recommend methods for the ESE to encourage and enforce compliance with ESE core standards.

3. Deep community involvement

   SEEDS must define mechanisms for deep community involvement in refining and participating in the standards processes. The community is a source of valuable ideas, solutions, and requirements, and community participation will be vital to its acceptance by the community. The process must recognize and be responsive to a diverse community. A single standard may not apply to all missions, disciplines, and projects across the Enterprise. The process to establish core standards must have broad representation from the community

4. Responsiveness to change in requirements or enabling technology

   The process must be responsive to changes in requirements or enabling technology. We must recognize that standards need to evolve or risk obsolescence. At the same time the processes must be timely and efficient and produce high quality standards.

5. Requirements from multiple sources

   The process to identify and vet requirements from multiple sources (HQ, science interuse, applications, interagency and international agreements, etc.) for SEEDS needs to be developed. There is a need to foster opportunities for interagency communication and coordination, or we may not satisfy the needs of ESE. The SEEDS standards will not become widely accepted if requirements from multiple sources are not addressed.

6. Standards decision making process

   True consensus is difficult to reach in a broad and diverse community. Therefore, multiple options for decision-making in the standards process need to be identified. Both true consensus and the IETF principle of "rough consensus" along with other decision methods should be considered as candidate options for the decision making process. ESE, together with the affected communities, must determine the appropriate decision making process.

5 Workshop results

The study team discussed its findings and the notional standards process with the target community in the 2nd SEEDS workshop, in San Diego, California, in June, 2002.

This section provides highlights from that interaction, which took place over a half day of discussions in two groups of about 20 people each.

Limited representation in evaluating the notional standards process. The general consensus was that although those who attended these discussions were able to provide useful opinions, the topic needed broader, deeper representation from the community. Suggestions for this included using a forum such as the Federation; seeking community participation in testing, prototyping, and evaluating standards (the stages where initial experience occurs); and involving community representatives in working committees.

General agreement on the process, but plenty of fine-tuning needed. The groups called for more detailed descriptions of process triggers (what conditions or decisions would initiate the process), gates (criteria for promoting or rejecting a draft at any stage), and roles and responsibilities.

Questions about the scope of the process. The groups cautioned that the notional process was currently very NASA-centric. They wondered whether the IETF model was appropriate for a smaller more narrowly focused endeavor than Internet protocols. They urged the study team to engage vendor and IT groups.

Questions about the scope of an ESE Standard. For instance: For whom would ESE standards be mandatory? Would there be a waiver process? How would this process allow for core vs. community standards? How would these standards be reflected in procurement requirements? The groups felt that SEEDS / ESE should keep a “light touch” that would not “over-mandate.”

Fairness, accountability, and openness. The groups emphasized that the standards decision process must be clear & very open, with clear accountability for resulting outcomes, safeguards against conflicts of interest, and publicly available records of how decisions were reached.

Staffing the process. The groups cautioned that such a process could not rely on volunteers alone; and that its approach to staffing the process would affect how well it could retain community participation and ownership.

Funding the process. The groups discussed the funding needs implied by participating in the standards process, developing software and documentation tools, and evaluating proposed standards. Groups suggested funding community representatives to participate in committees. They also recommended associating project funding with use of core standards. Finally, they suggested that vendor participation and partnerships may result in cost-sharing relationships.

6 Future Work

The separate Near-Term Mission Standard (NTMS) and the Long-Term Standards Process (LTSP) studies have completed their work, but the SEEDS Standards Process requires further definition. A merged SEEDS Standards Process Support group composed of members of the two separate study teams (NTMS and LTSP) will continue this work. Even broader input and deliberation is required. The REASoN CAN awardees and others will augment the group of process consultants and active study participants. Considerable work remains in order to refine and add detail to the process descriptions, address the identified issues, iterate the results of the LTSP, and support the recommendations of the NTMS.

The SEEDS Standards Process will direct its efforts in a number of areas. The review of data and information systems projects and formal standards organizations is complete, but the team will continue to maintain and update the LTSP report as required. As SEEDS begins transition into operation, the standards process must prepare to consider candidate ESE standards beginning with the recommendations of the NTMS study. In support of the overall transition, the Standards Process Support group will work jointly with the REASoN CAN awardees on defining responsibilities and begin acting on these recommendations and integrating them with the broader recommendations of the SEEDS formulation.

Appendix 1: List of acronyms

Acronym	Description
CCSDS	Consultative Committee for Space Data Systems
ECS	EOSDIS Core System
EOSDIS	Earth Observing System Data and Information System
ESE	NASA Earth Science Enterprise
FGDC	US Federal Geographic Data Committee
IETF	Internet Engineering Task Force
ISO	International Organization for Standardization
LTSP	Long Term Standards Process
NSDI	National Spatial Data Infrastructure
NTMS	Near-Term Mission Standards
OGC	Open GIS Consortium
SEEDS	Strategic Evolution of ESE Data Systems
V0	Version 0 (of EOSDIS)
W3C	World Wide Web Consortium

Appendix 2: List of URLs

URL	Description
http://www.ccsds.org/	CCSDS
http://www.fgdc.gov/standards/refmod97.pdf	FGDC Standards Reference Model
http://www.fgdc.gov/framework/framework.html	FGDC framework
http://www.fgdc.gov/standards/status/textstatus.html	FGDC standard list
http://gcmd.gsfc.nasa.gov	GCMD web site
http://www.ietf.org/rfc/rfc2026.txt	IETF standard process
http://www.ietf.org/glossary.html#IETF	IETF glossary
http://www.opengis.org	OGC
http://mcmcweb.er.usgs.gov/sdts/	Spatial Data Transfer Standard
http://www.w3.org/	W3C